Utilizing Desktop Fabricated Sensors to Measure Transpiration Rates in Glycine max

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By the year 2050, the global population is projected to reach nine billion people. This means that the global food supply will need to double to keep up with the demand. Unfortunately, even the current level of production is unsustainable, displayed by the rapid decline in aquifer levels in recent years. Irrigation Scheduling may help increase production while decreasing water usage. Irrigation scheduling depends on evapotranspiration rates and plant maturity, yet despite the importance of these measurements, they often require costly and time-consuming methods to accurately gather the required data. The focus of this experiment was to find a more cost-effective and accurate method for analyzing transpiration rates in soybean (Glycine max). By using three-dimensional printing technology and low-cost electrical components, the data collection process will become much cheaper and less labor-intensive. To achieve this goal, an Arduino board was attached to three probes, each consisting of thermocouple wire. A system was designed to deliver a heat-pulse at a regular interval and then record the time it took for the pulse to reach a heat-detection probe. This time frame over a known distance is how the transpiration measurements are taken. These benefits are intended to increase the sample size of individual measurements, creating an overall more accurate view of a regions' irrigation requirements, rather than small, representative samples of entire regions' requirements, and therefore increase aquifer conservation and economic returns. The results from this study on the plant scale will inform field-scale evapotranspiration rates in the region.

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